

Cosmology for Non-Science Majors

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Introduction

Observational advances have considerably broadened the experimental base for cosmology (the scientific study of the formation of the universe) in recent years. NASA's Cosmic Background Explorer (COBE), the Hubble Space Telescope (HST), and very recent supernova data have given scientists glimpses of the hot universe as early as 300,000 years after the big-bang, and evidence of the galaxy formation thereafter. In spite of these dramatic observational advances, there is a perception in the lay population that study of the early universe is largely based on speculation. To help counter this notion, a new course is being developed, to be taught at South Carolina State University (SCSU), whose aim is to present the scientific evidence for the big-bang universe at a level suitable for non-science majors who have at least completed a course in pre-calculus.

Course materials under development will require hands-on, active learning on the part of the student, reducing the amount of lecturing, and improving the likelihood of an effective course. Materials already available from other universities are being adapted for the SCSU course.

Course Structure

Scientific evidence in support of the big-bang picture of the early universe is quite abundant, so there is a need for some organizing scheme which is simple and comprehensible to a lay person. Evidence presented in this course is organized under three categories which constitute the major evidence supporting the big-bang: (1) the expanding universe, (2) the Cosmic Microwave Background, and (3) the abundance of helium. Each of these topics has deepened and broadened over the years to the point where there is now considerable overlap among them, but they are solid anchors for the novice. Necessary basic physics background will be taught to students so that each topic is built upon a strong foundation.

Scientific data within each category are usually presented in graphical form, and it is the aim of the course to give the student an understanding of these data, both by computer simulation, and by lab activities. In addition, a course web-site is being developed where the student (and anyone else) will have access to virtually all of the activity-based course materials, and access to links to other cosmology-related web-sites.

Summary

A course is being developed to present to non-science students the scientific evidence supporting the hot big bang model of the early universe. Hands-on activities and computer simulations are to be used to establish the necessary background for students to understand scientific data. These activities are being documented on a web-site so that they are always available for students, as well as others who are interested in such a course. An incomplete version of the web-site, including activities, references, and other links, can be found at <http://physics.scsu.edu/~dms/cosmology/home2.html>.